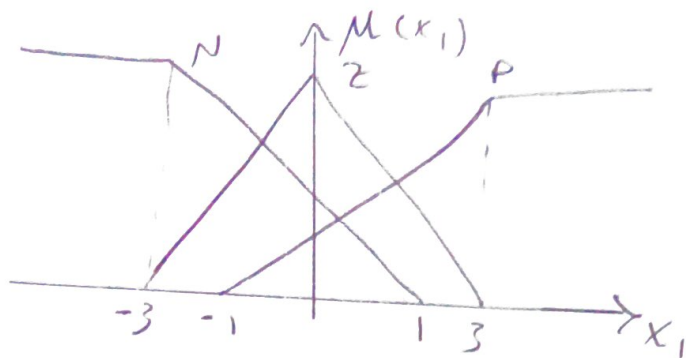


# Report 2 . Lec 5

sec3

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| $\Delta e$ | N | Z | P |
|------------|---|---|---|
| N          | P | P | Z |
| Z          | P | Z | N |
| P          | Z | N | N |

①  $x_1 = 0.5, x_2 = 0$   
 $x_1 \in N, Z, P$

$$\mu_N(x_1) = -0.75(x_1 + 1) = -0.75x_1 + 0.25$$

$$\mu_Z(x_1) = -0.33x_1 + 1; \quad \mu_P(x_1) = 0.25x_1 + 0.25$$

\*  $x_1 = 0.5 \rightarrow$

- $\rightarrow N; \mu = 0.125$
- $\rightarrow Z; \mu = 0.835$
- $\rightarrow P; \mu = 0.375$

$x_2 = 0 \rightarrow Z; \mu = 1$

② Fired Rules

R1: if  $x_1$  is N and  $x_2$  is Z then  $u$  is P

R2: if  $x_1$  is Z and  $x_2$  is Z then  $u$  is Z

R3: if  $x_1$  is P and  $x_2$  is Z then  $u$  is N

③ Strength of fired rules

$$\mu_{P_1} = \min(\mu_N(x_1); \mu_Z(x_2)) = \min(0.125, 1) = 0.125$$

$$\mu_{P_2} = \min(\mu_Z(x_1); \mu_Z(x_2)) = \min(0.835, 1) = 0.835$$

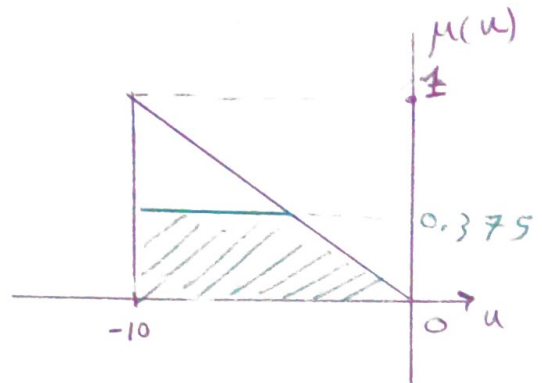
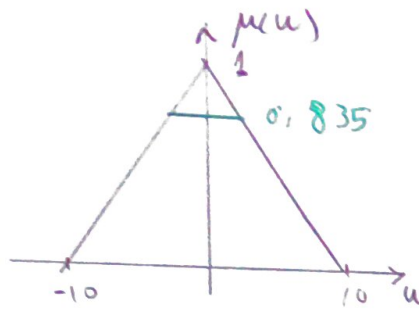
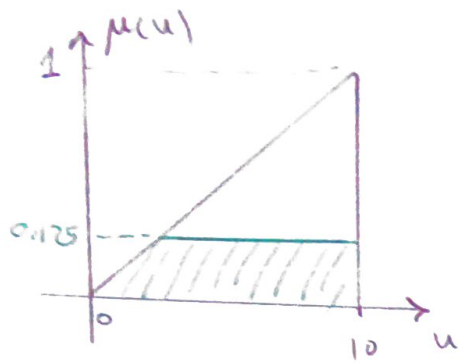
$$\mu_{P_3} = \min(\mu_P(x_1); \mu_Z(x_2)) = \min(0.375, 1) = 0.375$$

④ fuzzy sets output form

$$R1: \mu_P(u) = \min(\mu_P(u); 0.125)$$

$$R2: \mu_Z(u) = \min(\mu_Z(u); 0.835)$$

$$R3: \mu_N(u) = \min(\mu_N(u); 0.375)$$



⑤ overall output form

$\mu(u) = \frac{1}{10}u + 1$  at  $\mu(u) = 0.835 \Rightarrow u = 1.65$   
 $\mu(u) = -\frac{1}{10}u + 1$  at  $\mu(u) = 0.835 \Rightarrow u = -1.65$   
 $\mu(u) = 0.375$  at  $\mu(u) = 0.375 \Rightarrow u = -6.25$   
 $\mu(u) = 0.125$  at  $\mu(u) = 0.125 \Rightarrow u = 8.75$

$$\begin{aligned}
 U^{\text{crisp}} &= \frac{\int_{-10}^{-6.25} 0.375 \cdot u \, du + \int_{-6.25}^{-1.65} \left(\frac{1}{10}u + 1\right) u \, du + \int_{-1.65}^{1.65} 0.835 u \, du + \int_{1.65}^{8.75} \left(-\frac{1}{10}u + 1\right) u \, du + \int_{8.75}^{10} 0.125 u \, du}{\int_{-10}^{-6.25} 0.375 \, du + \int_{-6.25}^{-1.65} \left(\frac{1}{10}u + 1\right) \, du + \int_{-1.65}^{1.65} 0.835 \, du + \int_{1.65}^{8.75} \left(-\frac{1}{10}u + 1\right) \, du + \int_{8.75}^{10} 0.125 \, du} \\
 U^{\text{crisp}} &= \frac{-11.426 - 10.182 + 0 + 14.739 + 1.464}{1.406 + 2.783 + 2.756 + 3.408 + 0.156} \\
 &= \boxed{-0.514}
 \end{aligned}$$